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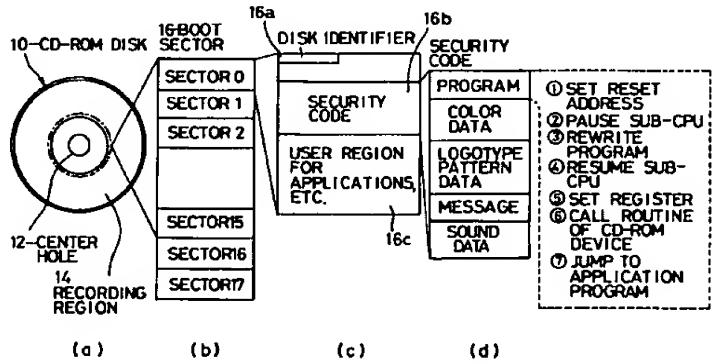
(54) CD-ROM disk and security check method for the same.

(57) A CD-ROM (10) comprises an identifier region (16a) having a disk identifier recorded therein and a security code region (16b) having a security code recorded therein. The identifier region and the security code region are provided in one sector of a boot sector (16) to be read when actuated. The disk identifier includes a preset identification code, and the security code includes at least a program to be executed after check of the security code, and display data for displaying a licence.

A security check method for a CD-ROM comprising the steps of reading data recorded in the boot sector of the CD-ROM when actuated, comparing the disk identifier read from the identifier region of the boot sector with an stored identifier to check whether or not the read disk identifier is correct, comparing the security code read from the security region of the boot sector with a stored security code to check whether or not the read security code is correct, and executing the program contained in the security code when the read disk identifier and the read security code are correct, and displaying a licence based on the display data.

FIG. 1



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BACKGROUND OF THE INVENTION

The invention relates to CD-ROMs (compact disk read only memories) and to security check methods for them.

The CD (compact disk) was originally developed as a sound recording medium, but more recently has attracted attention as a large capacity storage medium for information other than sound. Since the information on a CD is digitally recorded, it is suited for computer processing. Many types of information can be stored, including programs, data and images. CDs containing information other than sound recordings or additional to sound recordings are known as CD-ROMs.

Game software for television game machines is now supplied on CD-ROMs as an alternative to conventional cartridges. In addition to the game program, the CD-ROM can contain a large quantity of information readable as video images, sound, etc. This can be decoded in accordance with the progress of the game, enabling the provision of television games which are more illustrative and have better picture and sound quality.

Television game makers grant licences to make game software exclusively for use on their game machines. It is necessary for any given game machine to be able to recognise cartridges or CD-ROMs inserted in it as being of an appropriate format and as being duly licensed and proper for use in that machine. Once so recognised, it is desirable that the licence be displayed on the television as a preliminary to the game.

SUMMARY OF THE INVENTION

The invention provides a CD-ROM having a boot sector including an identifier region in which a disk identifier is recorded and a security code region in which a security code is recorded,

the disk identifier including a preset identification code, and

the security code including a program to be executed after check of the security code and display data for displaying a licence.

The invention also provides a security check method for a CD-ROM having a boot sector including an identifier region in which a disk identifier is recorded and a security code region in which a security code is recorded, the disk identifier including a preset identification code, and the security code including a program to be executed after check of the security code and display data for displaying a licence,

the security check method comprising:

a first step of reading data recorded in the boot sector of the CD-ROM when actuated;

a second step of comparing the disk identifier read from the identifier region (16a) of the boot sector (16) with a stored identifier to check whether or not the read disk identifier is correct;

a third step of comparing the security code read from the security region (16b) of the boot sector (16) with a stored security code to check whether or not the read security code is correct; and

a fourth step of executing the program contained in the security code when the read disk identifier and the read security code are correct, and displaying a licence based on the display data.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a plan view of a CD-ROM according to the invention, diagrammatically showing part of the information recorded on it;

Figure 2 is a first part of a flow chart illustrating a CD-ROM security check method according to the invention; and

Figure 3 is a continuation and conclusion of the flow chart of Figure 2.

DETAILED DESCRIPTION OF THE INVENTION

Referring to Figure 1(a), a CD-ROM 10 according to one embodiment of the invention has a diameter of 120 mm. A 15 mm-diameter centre hole 12 is formed in the centre of the CD-ROM 10. A boot sector 16 to be first read when actuated is provided on the innermost track of a recording region 14 in which ROM data and audio data is recorded.

As shown in Figure 1 (b), the boot sector has an area from Logic Sector Numbers 0 to 15. A data identifier and a security code are recorded in the boot sector, i.e., in plural ones of the sectors of the boot sector in view of possible recording or read errors. Usually they are recorded in the first sector of the boot sector having Logic Sector No. 0.

The disk identifier indicates a kind of the CD-ROM 10, and as shown in Figure 1(c) is usually recorded in an identifier region 16a at the foremost part of the boot sector 16. In this embodiment, two kinds of identifiers, "SEGADISCSYSTEM□□" and "SEGABOOTDISC□□□□" (□ represents a space) are used. The former identifier "SEGADISCSYSTEM□□" is a disk identifier to be used in a CD-ROM carrying game software which ends on the disk. The latter identifier "SEGABOOTDISC□□□□" is a disk identifier to be used in a CD-ROM carrying game software which is continued on a plurality of CD-ROMs, and is to be recorded in the first of the CD-ROMs carrying the game software.

The security code indicates that the CD-ROM 10 is duly licensed by a television game machine

maker. As shown in Figure 1(c), the security code is recorded in a security region 16b at a preset address in the boot sector 16.

As shown in Figure 1(d), the security code contains a program to be executed after a checking operation of the security code, colour data indicative of colours of LOGOTYPE to be displayed, LOGOTYPE pattern data indicative of patterns of LOGOTYPE to be displayed, message data indicative of a message "PRODUCED BY OR UNDER LICENCE FROM XXXX KABUSHIKI KAISHA)", and sound data indicative of a licensor television game machine maker.

This embodiment is especially characterized in that a program itself to be executed following checking of the security code is contained in the security code. The program involved in this embodiment is executed by the main CPU of a television game machine. As shown in Figure 1(d), the program includes seven steps.

In the first step, an address to which the main CPU jumps when the television game machine is reset is set.

In the second step, a sub-CPU provided in a CD-ROM reader which forms part of the television game machine is temporarily paused.

In the third step, the contents of the program memory of the sub-CPU are rewritten from data recorded on the CD-ROM.

In the fourth step, the operation of the temporarily paused sub-CPU is resumed.

In some television game machines, these second through fourth steps may be omitted.

In the fifth step, the head addresses of data recorded on the CD-ROM are set in a register of the main CPU. In the sixth step, a required program routine stored in the CD-ROM device is executed. This program routine performs a resetting operation, such as licence display.

The program routine involved in this embodiment performs the following resetting operation.

First a vertical interrupt address is set. Next, a sound processor and a video processor are reset, while a video RAM is cleared, and ASCII character graphics are set. Then, based on colour data stored in the security code 16b, display colours are set, and based on LOGOTYPE data in the security code 16b, LOGOTYPE character graphics are set. Subsequently message data (PRODUCED BY OR UNDER LICENCE FROM XXXX KABUSHIKI KAISHA) in the security code 16b are displayed on a television screen, and a LOGOTYPE map is set to display LOGOTYPE on the television screen. Then, after one second, based on sound data stored in the security code 16b, sounds indicative of a licensor television game machine maker are outputted, and a LOGOTYPE mark colour is changed, and then the television screen display is cleared.

Finally in the seventh step, a jump is performed to an application program, such as a game program.

A CD-ROM security check method according to one embodiment of the invention is next described with reference to Figures 2 and 3 of the drawings.

In the flow charts of Figures 2 and 3, Steps 101 to 106 are for checking the security code by the sub-CPU of the CD-ROM reader provided in the television game machine. Step 107 and subsequent steps are for operations by the main CPU provided in the television game machine.

First it is determined whether or not one piece read from the CD-ROM 10 is a ROM track (Step 101). If it is not a ROM track, the disk is determined to be a conventional music CD.

If it is determined to be a ROM track, the first sector of the boot sector 16 is loaded (Step 102). Next, the disk identifier recorded in the identifier region 16a of the boot sector 16 is compared with a disk identifier stored in the memory of the CD-ROM reader (Step 103).

If the recorded and stored identifiers do not agree, it is determined whether or not all the sectors of the boot sector 16 have been loaded (Step 104). If all the sectors of the boot sector 16 have not been loaded, a next load sector is set (Step 105), and the processing is returned to Step 102. If all the sectors of the boot sector 16, and there is still no agreement between the the recorded identifier and the stored identifier, the disk is determined to be a CD-ROM but not a game disk.

When the recorded identifier agrees with the stored identifier in Step 103, then a security code recorded in the security region 16a in the boot sector 16 is compared with the security code stored in the memory of the CD-ROM device (Step 106). If the recorded security code agrees with the stored security code, the CD-ROM is determined a duly licensed proper game disk. If the recorded security code does not agree with the stored security code, the disk is determined a different disk.

The processing heretofore is the operation of the sub-CPU provided in the CD-ROM reader. This processing is followed by the operation by the main CPU provided in the television game machine.

First, it is determined whether or not the loaded CD-ROM 10 is a game disk (Step 107). If the disk is not a game disk, the operation for the usual music CD is enabled (Step 108). Incessantly it is determined whether or not the tray of the CD-ROM reader is opened (Step 109). If it is determined that the tray has been opened, there will be a possibility that the loaded CD-ROM 10 has been replaced, and the processing is returned to Step 101.

In Step 107, when the loaded CD-ROM 10 is determined to be a game disk, "CD-ROM" is displayed on the television screen (Step 110), and both the operation of the usual musical CD and the game operation are enabled (Step 111). Incessantly it is determined whether or not the tray of the CD-ROM reader is opened (Step 112). If it is determined that the tray has been opened, there will be a possibility that the CD-ROM 10 has been replaced, and the processing is returned to Step 101.

Subsequently it is determined which has been selected between the usual musical CD operation and the game operation (Step 113). If the game operation is selected, Step 114, which will be explained below, will follow.

First, the security code is loaded from the CD-ROM 10 (Step 114). Then a program contained in the security code starts to be executed (Step 115).

The first step of the program is executed, and an address to which the main CPU should jump when the television game machine is reset is set (Step 116).

Then, the second step of the program is executed, and the operation of the sub-CPU provided in the CD-ROM reader is temporarily paused (Step 117).

Next, the third step of the program is executed, and contents of the program memory of the sub-CPU is rewritten from data recorded on the CD-ROM 10 (Step 118).

Then the fourth step of the program is executed, and the operation of the temporarily paused sub-CPU is resumed (Step 119).

In some television game machines, these steps 117 to 119 can be skipped.

Then the fifth step of the program is executed, and the head addresses of data recorded in the CD-ROM are set in a register provided in the main CPU (Step 120).

Next, the sixth step of the program is executed, and a required program routine stored in the CD-ROM device is executed (Step 121). In this program routine, resetting operation including the above-described licence display, etc. is performed.

Returning from the program routine stored in the CD-ROM device, the seventh step of the program is executed to jump to an application program (Step 122), and the execution of the application program of a game or others is started, and the security check operation of the CD-ROM is finished.

The invention is not limited to the particular embodiment described above. Other embodiments within the scope of the appended claims are included. For example, the program contained in the security code is not limited to the program above described but may be any kind of program.

Claims

1. A CD-ROM (10) having a boot sector (16) including an identifier region (16a) in which a disk identifier is recorded and a security code region (16b) in which a security code is recorded,

   the disk identifier including a preset identification code, and

   the security code including a program to be executed after check of the security code and display data for displaying a licence.

2. A CD-ROM (10) according to claim 1 wherein the security code includes a LOGOTYPE data indicative of LOGOTYPE to be displayed.

3. A CD-ROM (10) according to claim 1 or claim 2 wherein the program includes:

   a first step in which head addresses of data recorded on the CD-ROM (10) are set in a register of the main CPU of the machine on which the CD-ROM (10) is operated; and

   a second step in which a required program routine stored in the said machine is executed.

4. A CD-ROM according to claim 1 or claim 2, wherein the program includes:

   a first step in which a sub-CPU provided in a machine on which the CD-ROM (10) is operated is temporarily paused;

   a second step in which the contents of the program memory of the sub-CPU are rewritten from data recorded on the CD-ROM (10);

   a third step in which operation of the temporarily paused sub-CPU is resumed;

   a fourth step in which head addresses of data recorded on the CD-ROM are set in a register of the main CPU of the said machine; and

   a fifth step in which a required program routine stored in the said machine is executed.

5. A security check method for a CD-ROM (10) having a boot sector (16) including an identifier region (16a) in which a disk identifier is recorded and a security code region (16b) in which a security code is recorded, the disk identifier including a preset identification code, and the security code including a program to be executed after check of the security code and display data for displaying a licence,

   the security check method comprising:

   a first step of reading data recorded in the boot sector of the CD-ROM when actuated;

   a second step of comparing the disk identifier read from the identifier region (16a) of the boot sector (16) with a stored identifier to

check whether or not the read disk identifier is correct;

a third step of comparing the security code read from the security region (16b) of the boot sector (16) with a stored security code to check whether or not the read security code is correct; and

a fourth step of executing the program contained in the security code when the read disk identifier and the read security code are correct, and displaying a licence based on the display data.

6. A security check method according to claim 5 wherein the security code includes a LOGOTYPE data indicative of LOGOTYPE to be displayed, and wherein the fourth step further includes displaying a LOGOTYPE based on the LOGOTYPE data.

7. A security check method according to claim 5 or claim 6 wherein the fourth step includes:

a first step of setting addresses of data recorded in the CD-ROM (10) in a register of the main CPU of a machine on which the CD-ROM (10) is operated; and

a second step of executing a required program routine stored in the said machine.

8. A security check method according to claim 5 or claim 6, wherein the fourth step includes:

a first step in which a sub-CPU provided in a machine on which the CD-ROM (10) is operated is temporarily paused;

a second step of rewriting the contents of the program memory of the sub-CPU from data recorded on the CD-ROM (10);

a third step of resuming operation of the temporarily paused sub-CPU;

a fourth step of setting addresses of data recorded on the CD-ROM (10) in a register of the main CPU of the said machine; and

a fifth step of executing a required program routine stored in the said machine.

FIG. 1

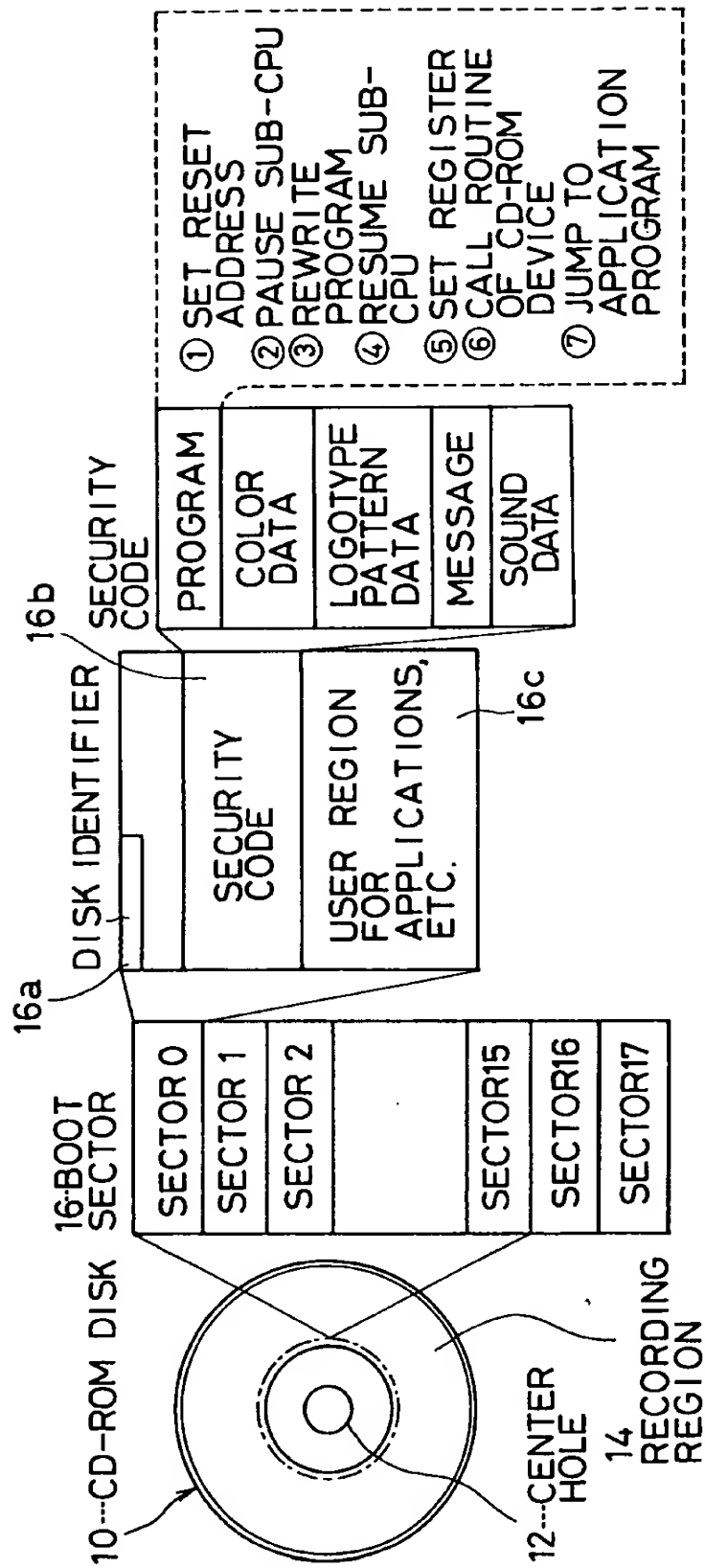

10--CD-ROM DISK
12--CENTER HOLE
14 RECORDING REGION
16-BOOT SECTOR
SECTOR 0
SECTOR 1
SECTOR 2
SECTOR15
SECTOR16
SECTOR17
16a
DISK IDENTIFIER
16b
SECURITY CODE
USER REGION FOR APPLICATIONS, ETC.
16c
SECURITY CODE
PROGRAM
COLOR DATA
LOGOTYPE PATTERN DATA
MESSAGE
SOUND DATA
① SET RESET ADDRESS
② PAUSE SUB-CPU
③ REWRITE PROGRAM
④ RESUME SUB-CPU
⑤ SET REGISTER
⑥ CALL ROUTINE OF CD-ROM DEVICE
⑦ JUMP TO APPLICATION PROGRAM
(a)
(b)
(c)
(d)

FIG. 2

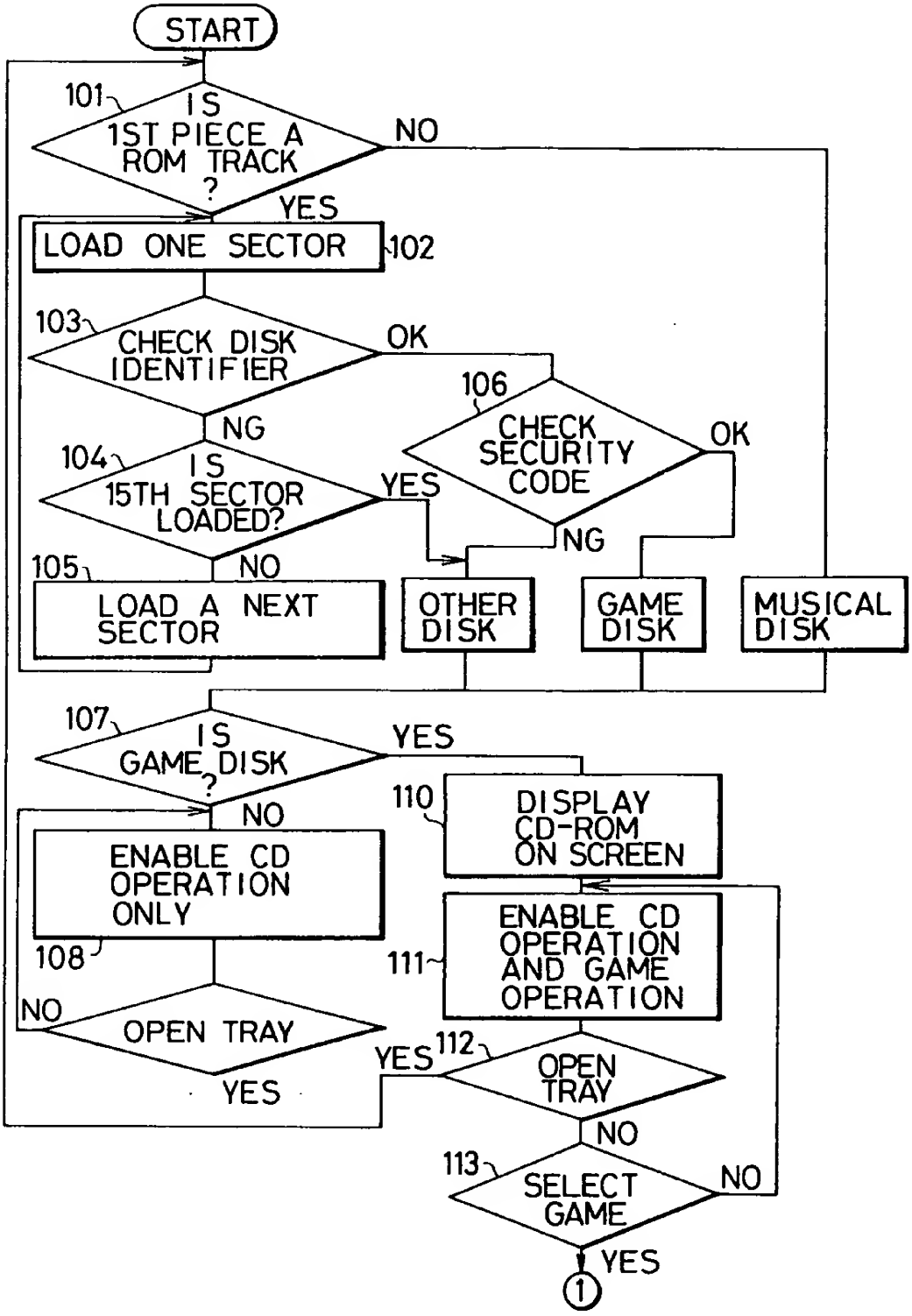
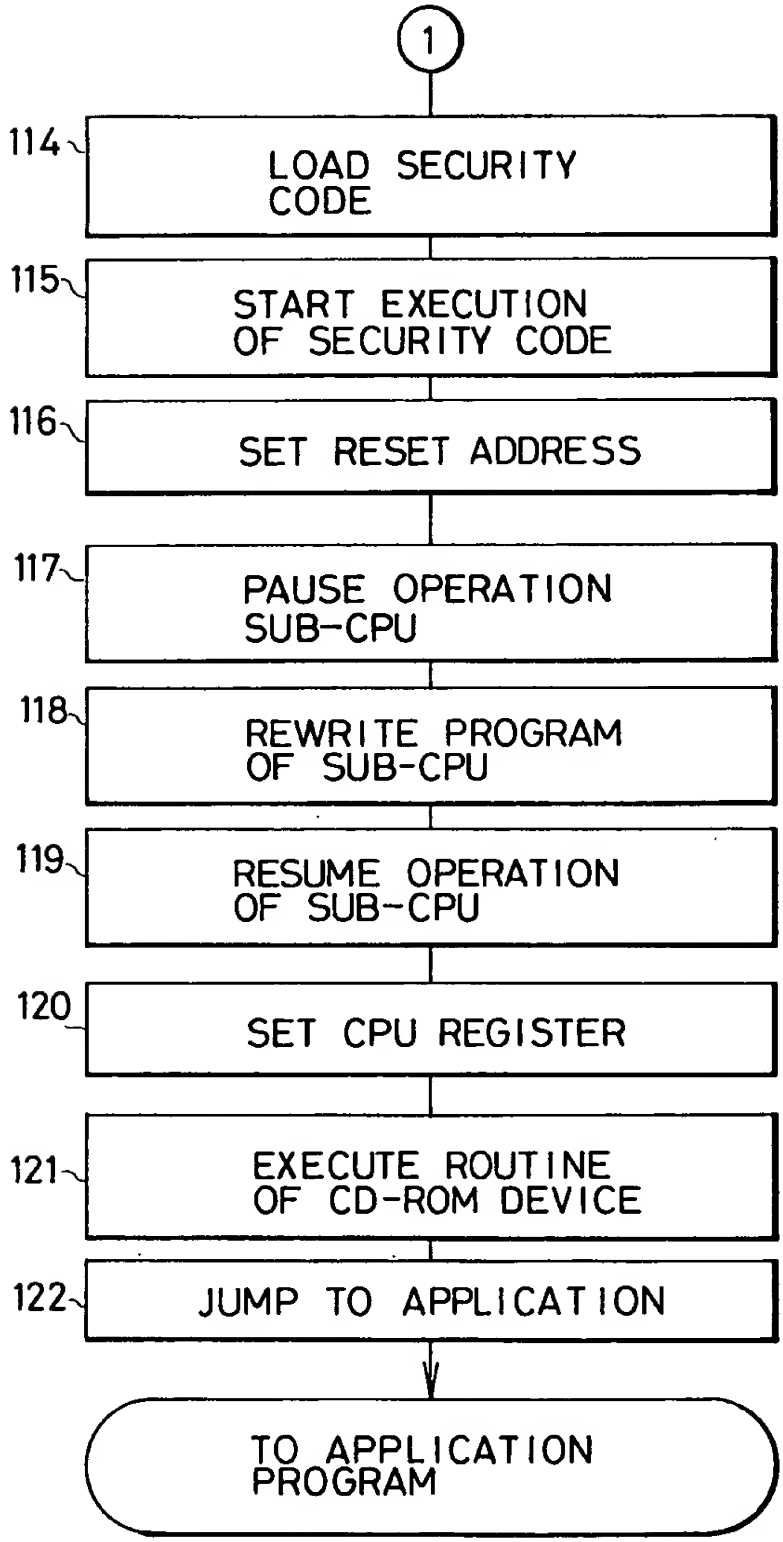

START
101
IS 1ST PIECE A ROM TRACK ?
NO
YES
LOAD ONE SECTOR
102
103
CHECK DISK IDENTIFIER
OK
NG
106
CHECK SECURITY CODE
OK
NG
104
IS 15TH SECTOR LOADED?
YES
NO
105
LOAD A NEXT SECTOR
OTHER DISK
GAME DISK
MUSICAL DISK
107
IS GAME DISK ?
YES
NO
110
DISPLAY CD-ROM ON SCREEN
ENABLE CD OPERATION ONLY
108
111
ENABLE CD OPERATION AND GAME OPERATION
NO
OPEN TRAY
YES
YES
112
OPEN TRAY
NO
113
SELECT GAME
NO
YES
1

FIG. 3


1
114
LOAD SECURITY CODE
115
START EXECUTION OF SECURITY CODE
116
SET RESET ADDRESS
117
PAUSE OPERATION SUB-CPU
118
REWRITE PROGRAM OF SUB-CPU
119
RESUME OPERATION OF SUB-CPU
120
SET CPU REGISTER
121
EXECUTE ROUTINE OF CD-ROM DEVICE
122
JUMP TO APPLICATION
TO APPLICATION PROGRAM